Geostationary Operational Environmental Satellite (GOES)

GOES-R Series

Solar coronagraph (SCOR)

Unique Instrument Interface Document (UIID)

Baseline Version
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National Aeronautics and Space Administration

Goddard Space Flight Center
Greenbelt, Maryland

To verify the correct version of this document, please contact the GOES R Series Requirements Management Office on 301-286-7898

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1 Scope

The purpose of this Unique Instrument Interface Document (UIID) is two-fold. The first is to allocate GOES-R series spacecraft resources to the Solar Coronagraph (SCOR). The second purpose is to serve as a core building block on which the SCOR-spacecraft interface can be designed.
The spacecraft integrating contractor and the SCOR contractor **shall** meet each of their respective interface requirements as defined in this document.
The Government will be the system integrator until a system performance contractor or spacecraft contractor with that responsibility is selected.
Until that time, the Government will be responsible for accommodation trades, resource allocation (weight, power, space, bandwidth, etc.), and resolving interface issues.
This UIID will govern the development of an Interface Control Document (ICD).
The ICD development will be a joint activity of the SCOR contractor and spacecraft contractor
This ICD establishes the details of the electrical, communications, mechanical, thermal, integration and test, and command and data handling (C&DH) interfaces between the SCOR and the GOES-R spacecraft.
After the ICD is signed and approved by all parties, the spacecraft contractor **shall** maintain the ICD.
This instrument requires primary power and command input data from the spacecraft. Instrument output data to the spacecraft contains instrument information, instrument telemetry and ancillary data.

1.1 Document Overview

Together, the General Interface Requirements Document (GIRD) and the SCOR UIID establish the SCOR spacecraft interface requirements. The GIRD applies to all GOES-R instruments while the SCOR UIID is specific to the SCOR. Section 1 explains the use of this document. Section 2 lists reference documents. Section 3 allocates spacecraft resources, such as mass, power, and data rate, to the SCOR instrument. Section 4 contains government-accepted operation constraints. Section 5 contains government-accepted deviations from the GIRD. Section 6 contains a list of acronyms used within this document.

1.2 Missing Requirements

The term "(TBD)", which means "to be determined", applied to a missing requirement means that the instrument contractor determines the missing requirement in coordination with the spacecraft contractor.
The term "(TBR)", which means "to be refined/reviewed", means that the requirement is subject to review for appropriateness by both contractor's, and subject to revision. Both the spacecraft and instrument contractors are liable for compliance with the requirement as if the "TBR" notation did not exist. The "TBR" merely provides an indication that the value is more likely to change in a future modification than requirements not accompanied by a "TBR".

1.3 Order of Precedence

The order of precedence of interface requirements documents is the UIID at the highest level, followed in order by the GIRD, ICD, and IDD.

2 Reserved

3 Allocations

The GOES-R spacecraft **shall** provide communications, power and a Sun-Pointing Platform (SPP) for the SCOR instrument throughout the entire mission. The following paragraphs allocate these resources to SCOR

3.1 Command and Data Handling

3.1.1 Instrument-to-Spacecraft Science Volume

The instrument science and engineering data rate, including all overhead associated with Consultative Committee for Space Data Systems (CCSDS) packetization by the instrument at the spacecraft interface, **shall** not exceed 1.0 million (10^6) bits per second when averaged over any 5 second period.

3.1.2 Non-critical Telemetry Data Rate

Housekeeping telemetry data rate, including all overhead associated with CCSDS packetization by the instrument, at the spacecraft interface **shall** not exceed 1024 bits per second when averaged over any 5 second period.

3.1.3 Application Process Identifiers

The SCOR **shall** use no more than 63 consecutive APIDs for science, telemetry, and command packets.

3.1.4 Advance Notice of Change in Sun-Pointing Platform (SPP) Position

The spacecraft **shall** provide the SCOR an advance notice, in the ancillary data packet, of a change in the SPP position.
The spacecraft **shall** send the notice at least 100 milliseconds prior to the initiation of the change. (TBR)

3.1.5 Spacecraft Telemetry Required for SCOR Data Processing

Spacecraft telemetry required to analyze SCOR data **shall** be provided to the SCOR ground system whenever SCOR data are available. The spacecraft data that are required to analyze the SCOR data includes the ephemeris, spacecraft attitude, flags to indicate the occurrence of any East-West or North-South maneuver for the SPP, and the SPP pointing data (TBR).

3.2 Power

3.2.1 Average Power

The SCOR **shall** draw no more than 60 Watts averaged over five (5) minutes (TBR).

3.2.2 Peak Power

The SCOR total peak power input including heaters **shall** be no more than 80 Watts over 30 seconds.

3.2.3 Survival Power

When the instrument is OFF, the instrument survival heaters shall consume no more than 20W (TBR) averaged over every 72 (TBR) minute period.

3.3 Mechanical

The requirements in this section apply to the structural and mechanical components of the instrument flight units.

3.3.1 Mass Properties

The SCOR, including all units and cabling between units, **shall** have mass less than 34 kilograms (kg).

3.3.2 Volume and Maximum Dimension

The SCOR, including all units, mounts, thermal blankets and connectors for both stowed and operational configurations, **shall** have dimensions that do not exceed the limits listed in the Instrument Unit Envelopes table. The envelope for the sensor unit articulates with the Sun Pointing Platform (SPP). For the sensor unit, height is in the Y direction of the SPP Coordinate Frame (SCF) defined in the GIRD. Width is measured in the Z direction of the SCF, and depth is in the X direction of the SCF. For the electronic units, height is in the direction normal to the mechanical interface plane.

Unit	Height (cm)	Width (cm)	Depth (cm)
Sensor	30	30	140
Electronics	10	30	30

3.3.3 Fields of View

The SCOR **shall** have the following unobstructed fields of view, free of glint from the spacecraft:

3.3.3.1 View of Sun

The SCOR **shall** have continual unobstructed 50 (TBR) degree full-width East-West view and 50 (TBR) degree full-width North-South view of the Sun, centered on the Sun, during normal operational periods.

3.3.4 Sun Pointing Platform

The spacecraft **shall** provide a SPP for mounting the SCOR.

3.3.4.1 Sun-Pointing Platform (SPP) Sun Slew

The spacecraft **shall** provide a priori notice of any SPP slewing to SCOR at least 100 milliseconds (TBR) before to the initiation of the slew.

3.3.5 SCOR Mounting Panel

The SCOR Mounting Panel **shall** be provided by the SCOR contractor as the "instrument side" of the SCOR/spacecraft interface.

3.3.6 Thermal Interface

3.3.6.1 Conduction

The SCOR Mounting panel / SPP interface **shall** be thermally isolated with mounting hardware/materials provided by the spacecraft contractor.
The spacecraft mechanical attachment **shall** have the following temperature range: -20 °C to 50 °C (TBR) and as cold as -90C at the end of eclipse.
Wire bundles leading away from the SCOR mounting panel **shall** be subjected to this temperature range.

3.3.6.2 Radiation Interface/Environment

The following table defines the thermal fluxes for four sides of the instrument:

	IR Energy		**Solar Energy (Direct and Reflected)**	
	Cold/Minimum watts/m^2	Hot/Maximum watts/m^2	Cold/Minimum watts/m^2	Hot/Maximum watts/m^2
Telescope facing the Solar Array	60	70	10	15
Telescope facing Spacecraft	40	200	10	100
Sun Side	0	60	1270	1440
Anti-sun Side	0	80	0	70

Notes:
For initial analysis and trade studies , the periphery of the instrument telescope facing between the two extremes (facing toward and facing away from the spacecraft) can be interpolated between the listed values.
The "solar" energy includes direct plus any solar energy reflected from the spacecraft. Solar flux table inputs ignores eclipses. The "IR" energy is thermal energy radiated from spacecraft surfaces. Assume Earth "IR" is zero for non-cryogenic radiator .

3.3.6.3 Thermal Interface - Thruster Plume Heat Flux

The maximum plume heat flux onto any SCOR surface **shall** not exceed 386 w/m^2 (TBR)

3.3.7 Cabling Between Units

The maximum length of the harness cables between units **shall** not exceed 1 meter.
Cables running to the sensor unit **shall** with stand its articulation for deployment and North-South solar

tracking.

4 Constraints

In order to ensure proper instrument performance or to prevent possible instrument damage, the following Government-approved constraints are imposed by the instrument developer on spacecraft integration and test activities, including launch, activation and operations. No constraints have been identified at this time.

5 GIRD Deviations

This section identifies General Instrument Requirements Document (GIRD) requirements that the government has deviated from for this instrument. Where appropriate, corresponding GIRD paragraph titles and numbers are identified in parentheses.

5.1 Molecular Contamination

(3.5.2.2.2 Molecular Contamination GIRD834)
The spacecraft shall contribute no more than 9 µg/cm^2 nonvolatile residue to instrument thermal control surface apertures, and the instrument optical aperture over the life of the spacecraft.

5.2 SpaceWire Data Rate

(3.2.5.5 SpaceWire Data Rate GIRD441)
Data transferred over the SpaceWire data bus shall be clocked at 12.5 MHz (TBR).

6 Acronyms and Abbreviations

APID	Application Process Identifiers
C&DH	Command and Data Handling
CCN	Contract Change Notice
CCSDS	Consultative Commitee for Space Data Systems
cu cm	cubic centimeters
GIRD	General Interface Requirements Document
GOES	Geostationary Operational Environmental Satellite
GSFC	Goddard Space Flight Center
Hz	Hertz
ICD	Interface Control Document
IDD	Instrument Description Documents
kg	kilogram(s)
m	meter(s)
m-g	milli-g's (Earth's gravitational acceleration)
MHz	Megahertz
µg	Microgram
N	Newtons (unit of force)
NASA	National Aeronautics and Space Administration
P^{3}I	Pre-Planned Product Improvement
PORD	Performance and Operations Requirements Document
SCOR	Solar Coronagraph

sec	second(s)
SPP	Sun-pointing platform
TBD	To Be Determined
TBR	To Be Reviewed
TBS	To Be Specified
W	Watts
UIID	Unique Instrument Interface Document